Engineering Specification Report

Plant Design Document Analysis

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ENGINEERING SPECIFICATION ANALYSIS

Focus Area: Entire Document

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1. Purpose and Scope of Documents:

• Defines engineering requirements and recommended practices for design of piping systems and layout of process plant for INEOS Project One, Antwerp, Belgium; to be used in conjunction with referenced documents, Plant Layout Specification and Piping Material Specification for process and utility piping systems (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 1 PURPOSE).

• Standard applies to basic design parameters and standards for piping systems and plant layout by FEED and EPC Contractor for onshore plants; explicitly not applicable to: main pipelines; underground sewage and open drain systems; instrument piping; piping under national/local authorities jurisdiction; piping under ASME Boiler & Pressure Vessel Code (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 2 SCOPE).

• Piping Material Class Service Index defines pipe classes and general notes for material/component selection for Project One (From "7650-8230-SP-100-0002_A14_Piping Matl Spec.pdf", Section 1 PURPOSE / Section 2 SCOPE).

• Specifies requirements for piping stress analysis and pipe support design and criteria for Project One (From "7650-8230-SP-100-0003_A3_Pipe Stress&Supt.pdf;", Title / Section 1 PURPOSE).

- Defines insulation requirements (hot, cold, dual service), materials, thickness tables and documentation for piping and equipment insulation (From "7650-8440-SP-100-0001_A6_Insulation - Piping & Equip.pdf", Title / Section 1 PURPOSE).

• Provides Basic Engineering Design Data (BEDD) including climatic, utilities, design life and unit conditions governing design inputs for Project One (From "7650-8820-SP-100-0001_A11_Basic Engineering Design Data.pdf", Title / Section 1 PURPOSE and Section 2 PROJECT DESCRIPTION).

• Applicable phases explicitly identified where stated: design (FEED and EPC), procurement, fabrication, erection/installation, testing and commissioning as referenced across piping standard, material spec, fabrication and testing references (e.g., piping standard Section 2

SCOPE; piping material spec Section 5 GENERAL NOTES; insulation Section 11 DOCUMENTATION; pipe stress Section 1 PURPOSE) (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 2 SCOPE; "7650-8230-SP-100-0002_A14_Piping Matl Spec.pdf", Section 5 GENERAL NOTES; "7650-8440-SP-100-0001_A6_Insulation - Piping & Equip.pdf", Section 11 DOCUMENTATION; "7650-8230-SP-100-0003_A3_Pipe Stress&Supt.pdf;", Section 1 PURPOSE).

2. Applicable Codes, Standards, and References:

- ASME B31.1 (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- ASME B31.3 (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- ASME B16.5 (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- ASME B16.9 (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- ASME B16.11 (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- ASME B16.20 (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- ASME B16.21 (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- ASME B16.34 (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- ASME B16.47 (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- API STD 610, API STD 617, API STD 650, API RP 686 and other API standards listed (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- NFPA 30 and NFPA 58 (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.2 Codes & Standards).
- ASME B36.10M and B36.19M (From "7650-8230-SP-100-0002_A14_Piping Matl Spec.pdf", Section 5.12 and Section 4.2 Codes & Standards).

• PED 2014/68/EU (Pressure Equipment Directive) (From "7650-8230-SP-100-0002_A14_Piping Matl Spec.pdf", Section 5.1 PRESSURE EQUIPMENT DIRECTIVE; and "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.1 General).

• ISO standards referenced for insulation and NDT (e.g., ISO 12241, ISO 15665, ISO 14692) (From "7650-8440-SP-100-0001_A6_Insulation - Piping & Equip.pdf", Section 4 REFERENCE DOCUMENTS; "7650-8230-SP-100-0002_A14_Piping Matl Spec.pdf", Section 4.2 Codes & Standards).

• Eurocodes and WRC bulletins for structural, seismic and local nozzle stresses (From "7650-8230-SP-100-0003_A3_Pipe Stress&Supt.pdf;", Section 4.2 Codes & Standards).

• Project standards list (multiple project-specific documents cited - e.g., 7650-8230-SP-100-0002 Piping Material Class; 7650-8230-SP-100-0003 Piping Stress; 7650-8440-SP-100-0010 Pressure Testing; 7650-8440-SP-100-0011 General Fabrication; 7650-8440-SP-100-0012 Controlled Bolt Tightening; 7650-8230-SP-100-0006 Standard Assemblies etc.) (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 4.3 Project Standards and "7650-8230-SP-100-0002_A14_Piping Matl Spec.pdf", Section 4.3 Project Standards; "7650-8230-SP-100-0003_A3_Pipe Stress&Supt.pdf;", Section 4.3 Project Standards; "7650-8440-SP-100-0001_A6_Insulation - Piping & Equip.pdf", Section 4 REFERENCE DOCUMENTS).

3. Design and Performance Requirements:

• Pipe sizes specified as Nominal Pipe Size; minimum pipe size NPS 1" unless specifically stated; NPS 1/2", 3/4", 1 1/2" are non-preferred; specified prohibited non-standard sizes list (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 5.1 Pipe Sizes).

• Flanged joints shall be minimised; specific permitted uses listed (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 5.2 Pipe Flanges).

• Minimum BOP elevations: onsite areas 500mm, offsite areas 600mm (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 5.5 Pipe Routing).

• Minimum clearances: between parallel flanges longitudinal 150mm staggered; 25mm minimum pipe-to-pipe bare or insulation; increased to 75mm for NPS 30" and above (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 5.6 Pipe Spacing).

- Valve ergonomics: Category 1 height 500mm to 1.5m and reach max 300mm (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 5.8.1 Table 2).

- Line blind types selection by flange rating per Table 3 (Figure '8' vs spade/spacer sizes per class) (From "7650-8230-SP-100-0001_A6_Piping Standard.pdf", Section 5.10 Line Blinds and Table 3).

- Vent & drain minimum sizes per header

END OF ENGINEERING SPECIFICATION ANALYSIS